

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 12580950/PHH/CJF	<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. <b>PCT/AU2005/000373</b>	International filing date ( <i>day/month/year</i> ) 16 March 2005	Priority date ( <i>day/month/year</i> ) 18 March 2004	
International Patent Classification (IPC) or national classification and IPC			
Int. Cl.	<b>F42B 3/12 (2006.01)</b> <b>F42B 3/103 (2006.01)</b>	<b>F42B 3/26 (2006.01)</b> <b>H01R 13/58 (2006.01)</b>	
Applicant ORICA EXPLOSIVES TECHNOLOGY PTY LTD et al			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
  - a. ☒ (sent to the applicant and to the International Bureau) a total of 7 sheets, as follows:
    - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Box No. I | Basis of the report   |
| <input type="checkbox"/> Box No. II           | Priority  |
| <input type="checkbox"/> Box No. III          | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/> Box No. IV           | Lack of unity of invention  |
| <input checked="" type="checkbox"/> Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> Box No. VI           | Certain documents cited   |
| <input type="checkbox"/> Box No. VII          | Certain defects in the international application  |
| <input type="checkbox"/> Box No. VIII         | Certain observations on the international application   |

Date of submission of the demand 18 January 2006	Date of completion of this report 26 June 2006
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>JEFFREY CARL</b> Telephone No. (02) 6283 2543

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on:

- ☒ The international application in the language in which it was filed
- ☐ A translation of the international application into \_\_\_\_\_, which is the language of a
- ☐ international search (under Rules 12.3(a) and 23.1 (b))
- ☐ publication of the international application (under Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages **1-26** as originally filed/furnished
- pages\* received by this Authority on \_\_\_\_\_ with the letter of \_\_\_\_\_
- pages\* received by this Authority on \_\_\_\_\_ with the letter of \_\_\_\_\_
- ☒ the claims:
- pages as originally filed/furnished
- pages\* as amended (together with any statement) under Article 19
- pages\* **27-33** received by this Authority on **18 January 2006** with the letter of **18 January 2006**
- pages\* received by this Authority on \_\_\_\_\_ with the letter of \_\_\_\_\_
- ☒ the drawings:
- pages **1/4-4/4** as originally filed/furnished
- pages\* received by this Authority on \_\_\_\_\_ with the letter of \_\_\_\_\_
- pages\* received by this Authority on \_\_\_\_\_ with the letter of \_\_\_\_\_

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-37	YES
	Claims	NO
Inventive step (IS)	Claims 3, 4, 7, 13-16, 18, 20, 23-25, 27-37	YES
	Claims 1, 2, 5, 6, 8-12, 17, 19, 21, 22, 26	NO
Industrial applicability (IA)	Claims 1-37	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

The following documents identified in the International Search Report have been considered for the purposes of this report:

(i)	US 2991714	(v)	US 1458740
(ii)	US 2767655	(vi)	US 6146598
(iii)	US 5423261	(vii)	US 5503077
(iv)	US 5648634	(viii)	US 5327835

**NEW CITATIONS**

- (ix) US 3897131 A (STAUFFER) 29 July 1975 (see whole document)  
 (x) US 5460549 A (MUZSLAY) 24 October 1995 (see whole document)

**Novelty (N) Claims 1-37**

Claims 1-37: These amended claims meet the criteria set forth in PCT Article 33(2) for novelty. The prior art published before the priority date does not disclose an electrical connector (nor a sheath element or detonator assembly) for secure retention of a signal transmission line to a detonator including a plug member of electrically insulating material, at least one bridge element passing through the plug member and a retaining means to retain the bridge element in the plug material as defined in the claims.

**Inventive Step (IS) Claims 1, 2, 5, 6, 8-12, 17, 19, 21, 22, 26**

Claim 1: This claim lacks an inventive step when compared to the disclosures of citation (ix) or (x). Each of these citations disclose electrical connectors solving a similar problem to that discussed in the present application and having all of the features defined in this claim, except that the connectors are not for use with detonators. It is considered that it would be obvious to a person skilled in the art to modify the devices of the citations to suit the opening of the detonator.

Claims 2, 5, 6, 8-12, 17, 19, 21, 22, 26: All of the features added by these claims are explicitly disclosed in either one (or both) of citations (ix) and (x).

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## Claims:

1. An electrical connector for secure retention of a signal transmission line to a detonator, the detonator having an opening provided for connection to said signal transmission line and being adapted to initiate in response to one or more electrical signals received via the signal transmission line, the electrical connector comprising:
- 5 a body of electrically insulating material adapted to form a plug member for said opening of said detonator;
- at least one bridge element comprising electrically conductive material extending
- 10 through said plug member and having a first end and a second end that emerge from said plug member, the first end being adapted for attachment to a signal transmission line and the second end being adapted for contact with an electrical component of the detonator; and
- retaining means for retaining each of said at least one bridge element in said plug
- 15 member to cause said at least one bridge element to resist slippage between said at least one bridge element and said plug member, each retaining means comprising means for bonding or clamping each of said at least one bridge element within said plug member and / or comprising a part of said at least one bridge element in contact with said insulating material, said part comprising at least one surface that extends at an angle to a direction of
- 20 force applied to said at least one bridge element by pulling or tugging one of said first end and said second end that emerge from said plug member.
2. The electrical connector of claim 1, wherein said first end and said second end that emerge from said plug member, emerge on opposite sides thereof.
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3. The electrical connector of claim 1, wherein each first end comprises a wire clasp or crimp for grasping the end of a wire emerging from the signal transmission line.
4. The electrical connector of claim 1, wherein said electrical component is selected
- 30 from the group consisting of: a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the

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detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, an SO8 packaging, a filter, a capacitor, a spark gap, a small outline integrated circuit, and a rectifier, or alternatively said electrical component is connected to a printed circuit board or a component thereof, means to allow protection from electrostatic  
5 damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, or an SO8 packaging, a printed circuit board or a component thereof, a resistor, a filter, a capacitor, a spark gap, a small outline integrated circuit or a rectifier.

10 5. The electrical connector of claim 1, wherein said at least one bridge element comprises a metal, a metal alloy, a ceramic, a rigid polymer, or a semiconductor.

6. The electrical connector of claim 5, wherein said at least one bridge element consists of a metal.

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7. The electrical connector of claim 6, wherein said at least one bridge element is formed by stamping a template from sheet metal.

8. The electrical connector of claim 1, wherein said part of said at least one bridge  
20 element that is in contact with said insulating material is adapted for abutment, impalement or engagement with an internal surface of said plug member, thereby to serve as the retaining means to retain said at least one bridge element in position within said plug member.

25 9. The electrical connector of claim 8, wherein application of a pulling or tugging force to one of said first end and said second end that emerge from said plug member, causes said part adapted for abutment, impalement or engagement with said internal surface of said plug member to impart a resistive force upon said internal surface, thereby causing slippage between said at least one bridge element and said plug member to be  
30 resisted.

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10. The electrical connector of claim 1, wherein said part of said at least one bridge element that is in contact with said insulating material comprises a bent, sinusoidal, coiled or stepped portion configured for interaction with an internal surface of the plug member.
- 5 11. The electrical connector of claim 10, wherein said part of said at least one bridge element that is in contact with said insulating material comprises a portion comprising at least one barb, hook or spike for impalement into an internal surface of the plug member.
12. The electrical connector of claim 11, wherein each barb, spike, or hook extends in a  
10 direction generally away from said second end of said at least one bridge element.
13. The electrical connector of claim 1, wherein the retaining means comprises a portion of said at least one bridge element having a convoluted path through the plug member such that the at least one bridge element frictionally engages the plug member to  
15 retain said at least one bridge element within the plug member.
14. The electrical connector of claim 1, wherein the retaining means is introduced into the plug member as a settable material and is set thereby to form said means for bonding.
- 20 15. The electrical connector of claim 1, wherein the plug member includes a portion adapted to extend into and frictionally engage with an internal surface of a shell of the detonator at said opening thereof.
16. The electrical connector of claim 1, wherein the plug member further includes an  
25 annular recess to receive a detonator crimp, thereby to secure said plug member at said opening of the detonator.
17. The electrical connector of claim 1, wherein the plug member includes a threaded portion for threaded engagement with an internal surface of the detonator at said opening  
30 thereof.

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18. The electrical connector of claim 1, wherein the body of electrically insulating material comprises at least one bend and said at least one bridge element comprises at least one corresponding bend thereby to cause engagement therebetween, so as at least to assist in retention of said at least one bridge element within said plug member.

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19. The electrical connector of claim 1, further comprising a sheath element for sheathing at least one electrical connection between said signal transmission line and said at least one bridge element, the sheath element comprising:

(a) an elongate body adapted for association at one end thereof with the electrical  
10 connector; and

(b) a longitudinal bore extending therethrough for receiving the signal transmission line and at least a portion of each bridge element.

20. The electrical connector of claim 19, wherein the sheath element is at least partially  
15 made of a flexible material.

21. The electrical connector of claim 19, wherein the sheath element is adapted for releasable engagement with the electrical connector such that the sheath element can be selectively disengaged from the electrical connector to expose said at least one bridge  
20 element and / or said at least one electrical connection.

22. The electrical connector of claim 19, wherein the sheath element is permanently fixed to the electrical connector.

25 23. The electrical connector of claim 19, wherein the sheath element and the electrical connector are unitary in construction.

24. The electrical connector of claim 19, wherein the sheath element further comprises one or more transverse ridges along the body to impart flexibility to the sheath element.

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25. The electrical connector of claim 19, wherein the sheath element further comprises

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a flex point defined by a narrow portion of the elongate body.

26. The electrical connector of claim 21, wherein the releasable engagement is provided by a friction fit or an interference fit.

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27. A sheath element for connection to the electrical connector of claim 1 for sheathing electrical connections between said signal transmission line and said at least one bridge element, said sheath element comprising:

10 (a) an elongate body adapted for association at one end with the electrical connector and comprising at least one transverse ridge for imparting flexibility to the sheath element; and

(b) a longitudinal bore extending therethrough for receiving the signal transmission line and at least a portion of each bridge element.

15 28. The sheath element of claim 27, wherein the sheath element is at least partially made of a flexible material.

29. The sheath element of claim 27, wherein the sheath element is adapted for releasable engagement with the electrical connector such that the sheath element can be  
20 selectively disengaged from the electrical connector to expose said at least one bridge element and / or said at least one electrical connection.

30. The sheath element of claim 27, wherein the sheath element is permanently fixed to the electrical connector.

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31. The sheath element of claim 27, wherein the sheath element and the electrical connector are unitary in construction.

32. The sheath element of claim 27, further comprising a flex point defined by a  
30 narrow portion of the elongate body.



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33. The sheath element of claim 27, wherein the releasable engagement is provided by a friction fit or an interference fit.

34. An assembly comprising the electrical connector of any one of claims 1 to 26, in combination with at least one electrical component of a detonator, said at least one bridge element being in electrical contact with said at least one electrical component.

35. The assembly according to claim 34, wherein said at least one electrical component is selected from the group consisting of: a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, an SO8 packaging, a filter, a capacitor, a spark gap, a small outline integrated circuit, and a rectifier, or alternatively said electrical component is connected to a printed circuit board or a component thereof, means to allow protection from electrostatic damage to other electronic components of the detonator, a resistor, a varistor, a zener diode, a suppressor diode, an encapsulated integrated circuit, or an SO8 packaging, a printed circuit board or a component thereof, a resistor, a filter, a capacitor, a spark gap, a small outline integrated circuit, or a rectifier.

36. The assembly according to claim 34, wherein said at least one bridge element is soldered to at least one circuit element of a printed circuit board.

37. A detonator assembly comprising:  
a detonator shell including a percussion-actuation end and an opening at an end opposite said percussion-actuation end;  
a base charge adjacent the percussion-actuation end of the shell;  
the assembly of claim 34, fixed to said detonator shell at least in part by securing said plug member to said opening, said at least one electrical component being retained within the shell, said at least one bridge element including a part that emerges from said plug member within said shell for electrical contact with said at least one electrical component and a part that emerges from said plug member and extends away from said

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shell for electrical contact with a signal transmission line ; and

initiation means associated with said at least one electrical component for transfer of one or more appropriate initiation signals to the base charge for actuation thereof in response to appropriate signal(s).

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